SOUTHERN CALIFORNIA ASSOCIATION of GOVERNMENTS

Supplement 2 of 2 to: Environmental Justice Analysis Framework for the 2012 RTP/SCS Work in Progress Subject to Revisions

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AND
SUNY-BUFFALO

Growth Vision Implementation in Transit-Oriented Communities of the Southern California Region: Any Sign of Progress?

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SCAG Quick Facts

- Nation's largest Metropolitan Planning Organization (MPO)
- 6 counties, 191 cities and 38,000 square miles.
- 18 million people (5.8% of US population; 48.5% of California population)
- 16th largest economy in the world
- 10,000 lane miles of freeway; 4 major airports; Nation's global gateway for trade

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Background

- Transit-oriented development (TOD)
  is designed to maximize access by transit and non-motorized transportation, and with other features (such as higher density, mixed use, urban design) to encourage transit ridership (Victoria Transport Policy Institute, 2010)
- Questions:
  1. Will TOD work in Southern California?
  - Southern Californian are well known for prevalent car use due to extended freeways and sprawled land use
  2. How to monitor the performance of TOD projects?

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Visioning Process

- Visioning process is used by regional planners to develop regional land use scenarios.
  - Visioning is a highly community oriented planning technique used to create regional land use and transportation goals (FHWA 1996).
  - It involved gathering of participants and stakeholders to form a consensus vision (Barbour and Teitz, 2006)
  - It was used to identify preferred types of development and growth pattern (Berke, Godschalk, and Kaiser, 2006)

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SCAG Growth Vision

- To respond the challenges of future land use and transportation development, the Southern California Association of Governments (SCAG) launched a Compass Blueprint visioning program in 2000
- In 2004, the SCAG visioning program was developed with the following four key principles to guide future decision on development and growth:
  (1) mobility - getting where we want to go;
  (2) livability - creating positive communities;
  (3) prosperity – maintaining the long-term health; and
  (4) sustainability - promoting the efficient use of natural resources

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Transit-Oriented Development (TOD)

- California Senate Bill 375 (SB 375) promotes a Transit Priority Project (TPP) as an approach to reducing Greenhouse Gas (GHG) emissions in the Regional Transportation Plan (RTP)
- TPP requirements include high residential density (>20units/acre), mixed use, and close to major transit stops (in ½ mile) and high-quality transit corridors
- A TPP is generally considered as a TOD project

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Transit-Oriented Communities (TOCs)

- SCAG Growth Vision program encourages TOD types of community development
- The larger growth is expected in both residential and commercial areas near major transit stations and other identified transit centers
- It is important for planners of the SCAG to monitor and assess the progress of the Vision program.
- Data for 125 Transit-Oriented Communities (TOC's) were collected to analyze their economic, social, and environmental well-beings

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Objective 1

- **Evaluate whether TOC areas are moving toward more desirable, sustainable, and livable communities**

Approach & Data

- Apply block group data procured from 2000 Census and 2005-09 ACS, and calculate a set of performance indicators between TOC and the other areas.
- We demonstrate some trends between the two time periods to evaluate the effects of TOC areas

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Objective 2

- **Understand social and travel characteristics of the households staying at the TOC areas**

Approach & Data

- Using a disaggregated data set procured from the 2009 National Household Travel Survey (NHTS), we analyzed interlinks among demographic, economic, and travel characteristics of the households who stay in TOC areas and in the SCAG region

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Performance Indicators

- Performance indicators were developed for both SCAG region and TOC areas based on the following five categories: (1) Growth, (2) Economies, (3) Sustainability, (4) Equity, and (5) Transportation

TOC's

- A half mile buffer zones of 125 commuter rail and urban rail stations
- The communities were Identified by Census block groups and NHTS households

Growth

Census/ACS

Population & Households

- The growth rates of population and households in TOC areas were at least 10% higher than those in the entire SCAG region
- The households and population in the TOC areas share about 3-4% of the region

Total	2000	05-09	% Growth
Population	16,516,006	17,737,412	7.4%
Households	5,386,491	5,689,831	5.6%
TOC	**2000**	**05-09**	**% Growth**
Population	546,982	642,379	17.4%
Households	179,355	210,620	17.4%
TOC/Total	**2000**	**00-05**	**% Growth**
Population	3.3%	3.6%	9.4%
Households	3.3%	3.7%	11.2%

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Economies

Income, Workers & Jobs

Census/ACS

- Median household income in the TOC areas was lower than the regional average. However, the growth rates for the workers and jobs in the TOC areas were faster than those in the entire region.
- The type of workers' occupation or employed industry may affect the economic indices

HH. Income	2000	05-09	% Growth
Region	50,855	49,015	-4%
TOC	32,728	33,262	2%
Workers	**2000**	**05-09**	**% Growth**
Region	6,810,823	8,082,681	19%
TOC	203,573	286,368	41%
Jobs	**2000**	**05-09**	**% Growth**
Region	6,661,287	7,193,159	8%
TOC	1,001,443	1,173,754	17%

Median household income was converted to $1999

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Equity

% of Elderly & Hispanic Population

Census/ACS

- There is no dominant difference in age distribution between the SCAG region and the TOC areas, and between the two time points.
- The share of Hispanic population is about 13% higher in the TOC areas than in the SCAG region.

SCAG		
% Age	2000	05-09
<5	7.8%	7.6%
5-15	17.8%	16.3%
16-64	64.4%	65.8%
>65	9.9%	10.4%
All	100.0%	100.0%
% Hispanic	40.6%	44.2%

TOC		
% Age	2000	05-09
<5	8.5%	7.6%
5-15	17.6%	15.4%
16-64	65.0%	67.6%
>65	8.9%	9.4%
All	100.0%	100.0%
% Hispanic	54.0%	56.6%

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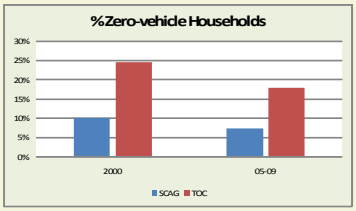
Sustainability

Vehicle Use

Census/ACS

- The TOC areas demonstrated higher shares of zero-vehicle households than the SCAG region, although the share is much declining in the TOC areas.
- Average per household vehicles increased by 13% in the TOC areas and by 8% in the region.



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Mean Difference
TOC vs. Non-TOC

Census/ACS

- ANOVA was applied to test the mean difference between 2000 and 2005-09 data:
- Major differences were highlighted with red colors using Turkey approach, and significant changes were found in vehicle use, density, and education related variables

Variable	Non-TOC	TOC	TOC+TOD	P-value
Percentage change of Household between 2000 and 2007	0.2043	1.1135	0.6353	
Percentage change of Employment between 2002 and 2007	-0.1513	0.0471	-0.0572	
Percent point change of High Educated People	0.0284	**0.0402**	**0.0520**	**
Percent point change of 0 Vehicle Household	-0.0250	**-0.0625**	**-0.0926**	***
Percent point change of Household in Rent	-0.0135	-0.0366	-0.0074	
Percent point change of Unemployment rate	0.1800	0.1921	0.1920	
Change of Household Density	0.0386	**0.1358**	**0.4571**	*
Change of Employment Density	0.2675	**1.4235**	**1.1515**	***
Percent point change of Hispanic population	0.0387	0.0211	0.0354	

P-value: * p<0.05; ** p<0.01; *** p<0.001

Mean Difference
by Rail Type

Census/ACS

- Breaking down TOC by Rail Type: Urban Rail / Commuter Rail
- While TOC with Commuter Rail had a significant change in the number of households, TOC with Urban Rail demonstrated significant changes in vehicle use, employment density, and education related variables.

Description	Non-TOC	Urban Rail	Commuter Rail	P-value
Percentage change of Household between 2000 and 2007	0.2043	0.3151	**2.5476**	*
Percentage change of Employment between 2002 and 2007	-0.1513	0.0486	0.0070	
Percent point change of Hispanic population	0.0387	0.0216	0.0251	
Percent point change of High Educated People	0.0284	**0.0511**	0.0227	***
Percent point change of 0 Vehicle Household	-0.0250	**-0.0823**	-0.0336	***
Percent point change of Household in Rent	-0.0135	-0.0453	-0.0088	
Percent point change of Unemployment rate	0.1800	0.1828	0.2107	
Change of Household Density	0.0386	0.2467	0.0283	
Change of Employment Density	0.2675	**1.7512**	0.6743	***

P-value: * p<0.05; ** p<0.01; *** p<0.001

Transportation – NHTS Data

NHTS

- There is no direct measure from Census or ACS to analyze transportation-related indicators
- Transportation System Information (TSI) of California Department of Transportation (Caltrans) supports 2009 NHTS California add-on data
- With about 6,700 households and 15,000 individual samples, the 2009 NHTS dataset provides valuable and sufficient observations to analyzing both demographic and travel characteristics of the SCAG region and the TOC areas.
- We analyze NHTS households with a quarter, a half, and one mile buffer zones from the 125 TOC stations.

TOC Household Characteristics

NHTS

Households in the TOC areas demonstrated

- Smaller household size;
- Higher percentages of single-person households and households without kids; and
- More workers in each household

than in the SCAG region

	HHsize	%1 person	%No Kids	%1 Retired	%2+ Retired	%HH Workers
toc025	2.28	44.6	46.4	19.6	7.1	59%
toc050	2.60	35.6	38.3	16.3	13.6	52%
toc100	2.80	28.4	34.8	13.4	17.0	49%
SCAG	2.82	22.3	30.2	12.0	24.4	49%

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TOC Travel Characteristics

NHTS

Households in the TOC areas

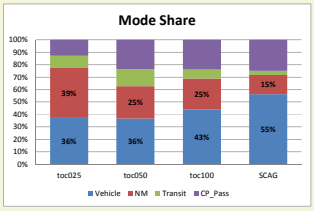
- less traveled and less drove

- higher shared non-motorized and transit modes, and lower shared vehicle mode

than the SCAG's.

Household Trips and Travel Distance

	Trips	Trip Dist	Veh. Trip	VMT
toc025	5.5	26.0	2.0	16.6
toc050	7.3	34.9	2.6	16.8
toc100	7.9	42.7	3.4	23.7
SCAG	8.5	57.5	4.7	35.9



TOC Travel Characteristics

Hispanic vs. Non-Hispanic

NHTS

- The share of Hispanic and non-Hispanic households in TOC is about 50-50 (while a table was not suggested)
- Compared to the SCAG region, both Hispanic and non-Hispanic population in TOC showed a similar pattern: less total trips and less VMT

Daily Travel and VMT

	Trips		VMT	
	N-Hisp	Hisp	N-Hisp	Hisp
toc025	5.1	5.8	23.7	10.7
toc050	6.3	8.0	20.5	14.0
toc100	6.9	8.8	28.2	19.2
SCAG	7.9	9.6	38.8	30.5

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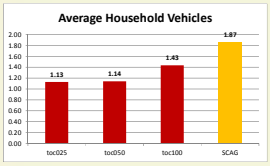
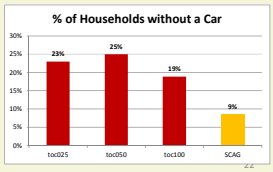
Auto Ownership

NHTS

- Compared to the SCAG Region, the TOC households had smaller number of vehicles.
- About 20% of the TOC households did not own a car; this is a double to that of the SCAG region.
- Vehicles are less available (or needed?) in TOC households



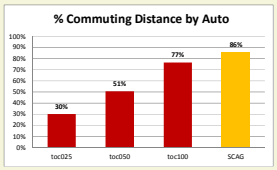


Commuting Distance by Auto

NHTS

- Total commuting distance is shorter for TOC workers
- Commuting VMT is much shorter for the TOC workers than for the workers in the SCAG region
- Compared to 86% of the SCAG region, about a half of commuting distance were made by auto to the TOC workers
- Is it self-selected?

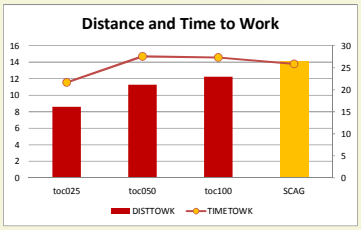
Home-Work Travel Distance	Vehicles	Total
toc025	4.1	13.6
toc050	9.7	19.2
toc100	16.5	21.5
SCAG	19.2	22.4



Commuting Distance and Time

NHTS

- Living in higher density neighborhoods (TOC) induces a shorter commuting distance, while commuting time is almost same.
- Is it self-selected?



Model Analysis

NHTS

- Using 2009 NHTS data, SCAG developed a 3-tiered model (Sustainability Tool) to analyze the impact of land use on VMT
- The 3-tiered model includes 1) auto ownership model, 2) vehicle trip making model, and 3) VMT model
- We adjusted the model by adding a TOC dummy. The model results showed that the TOC dummy coefficient is significant.
- By applying SCAG 2008 data (current) and 2035 data (forecast) to the model, we tested the performance of TOC areas on VMT and other transportation indicators

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Model Structure

Household Vehicle Ownership

NHTS

Household Vehicles Ownership

Dependent Variable: hhcar2 = 0, 1, 2, 3+
Ordered Probit Model

Variable	Coefficient	tandard Err	b/St.Er.	P[|Z|>z]	Mean of X|
Constant	0.402	0.050	7.968	0.000	
# Household Workers	0.815	0.023	34.895	0.000	0.987
Number of HH non-workers, 0-15	-0.002	0.022	-0.089	0.929	0.296
Number of HH non-workers, 16-64	0.635	0.025	25.397	0.000	0.467
Number of HH non-workers, 64+	0.599	0.028	19.468	0.000	0.431
Family Income (converted from dollar value $08 to $00)	0.144	0.005	27.248	0.000	4.845
Log of gross househod density of 1/4 mi buffer	-0.048	0.009	-5.302	0.000	0.855
Log of gross employment density of 1/4 mil buffer	-0.031	0.008	-4.053	0.000	1.094
Stop density of high-quality local bus (headway < 20 mins) - by	-0.534	0.068	-7.893	0.000	0.074
Regional accessibility - % of regional jobs accessed in auto 30 n	-1.216	0.253	-4.814	0.000	0.093
Mu(1)	1.548	0.020	76.124	0.000	
Mu(2)	3.007	0.024	124.645	0.000	

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Model Structure

Household Vehicle Trip Making

NHTS

Household Vehicle Trip Making Model

% of households will make at least one vehicle trip.
Dependent Variable: DA = 0, 1
(Binary) logistic model

Association of Predicted Probabilities and Observed Responses

Percent Concordant	84.7	Somer's D	0.696
Percent Disconcordant	15.1	Gamma	0.698
Percent Tied	0.3	Tau-a	0.199
Pairs	3186810	c	0.848

Variable	Estimate	t value	Pr > |t|
Constant	-3.605	110.3916	<.0001
# Household Workers	1.474	188.3764	<.0001
Number of HH non-workers, 0-15	0.160	2.8316	0.0924
Number of HH non-workers, 16-64	0.579	34.8242	<.0001
Number of HH non-workers, 64+	0.669	47.1871	<.0001
Family Income (converted from dollar value $08 to $00)	0.082	14.4836	0.0001
1 = household has 1 car	3.744	163.1985	<.0001
1 = household has 2 cars	4.116	190.8775	<.0001
1 = household has 3 cars	4.064	165.3191	<.0001
Log of gross househod density of 1/4 mi buffer	-0.089	5.075	0.0243
Connect / Walkability	-0.011	4.0506	0.0442
Stop density of high-quality local bus (headway < 20 mins) - by acres	-0.317	3.1579	0.0756
Proportion of Hispanic Household	-0.767	12.1873	0.0005
Dummy, 1 = has a rail station in T1 TAZ	-0.641	5.7613	0.0164
Regional accessibility - % of regional jobs accessed in auto 30 mins	0.361	0.1815	0.6701

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Model Structure

Household VMT

NHTS

Dependent Variable: autovmt
Linear regression

Observations	3929
F Value	138.04
R square	0.2425
Adj. R square	0.2407

	Estimate	t value	Pr > |t|	Inflation
Constant	10.357	4.17	<.0001	0.0000
# Household Workers	15.965	16.42	<.0001	1.9497
Number of HH non-workers, 0-15	1.994	2.1	0.036	1.0778
Number of HH non-workers, 16-64	8.026	7.51	<.0001	1.3541
Number of HH non-workers, 64+	2.206	1.8	0.0725	1.6830
Family Income (converted from dollar value $08 to $00)	1.894	7.91	<.0001	1.2623
Household vehicles	7.375	7.2	<.0001	1.4939
Log of gross household density of 1/4 mi buffer	-1.747	-4.41	<.0001	1.0685
Stop density of high-quality local bus (headway < 20 mins) - by acres	-5.023	-1.55	0.1212	1.1105
Regional accessibility - % of regional jobs accessed in auto 30 mins	-87.612	-7.84	<.0001	1.1546

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Model Results

NHTS

- According to the preliminary results, the TOC areas will experience significant reductions in household vehicle ownership and VMT per household, but increase in the transit use.
- At the same time, the percentage of walking may be slightly reduced.

Model Results between 2008 - 2035 (TOD Scaenario)

	Car/HH	VMT/HH	% Walking	% Transit
SCAG	1%	-1%	-3%	4%
TOC (2008)	-11%	-17%	-5%	24%

% Walking: Probability to make at least one walk trip
% Transit: Probability to make at least one transit trip

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Conclusions

- The key question of the study was whether the TOC areas are moving toward more desirable, sustainable, and livable communities to live?
- The analysis using Census/ACS has demonstrated significant but small changes in household growth and land use density.
- The NHTS and econometric analyses have shown that the TOC areas, due to easy access to transit services, local services, and working opportunities, may contain some significant benefits to the SCAG region.

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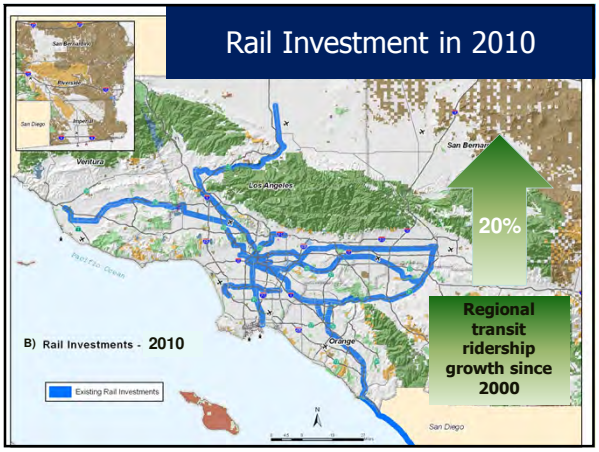
Rail Investment Condition in 1990

Rail Investment in 2010



Rail Investment in 2035

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